Radiology Case Reports

Volume 10, Issue 1, 2015

Bone metastasis on Tc99-m sestamibi myocardial perfusion scan

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A 75-year-old woman presented to our department for a stress myocardial perfusion imaging study with Tc99m-sestamibi. Incidental focal uptake, found in the left upper anterior chest, was initially felt to be located in the left breast. After additional single-photon CT imaging was performed the same day, extracardiac foci within the ribs, spine, and left lung (worrisome for active metastases) were shown to be present, with the initial focus located within a left rib rather than a breast. A review of previous radiographic and nuclear imaging studies confirmed metastatic disease from recurrent follicular thyroid cancer. Atypical focal extracardiac activity must be closely scrutinized for the possibility of malignancy, as Tc99m-sestamibi (in addition to being myocardium-avid) is tumor-avid.

Case report

A 75-year-old woman presented to our department to undergo a stress myocardial perfusion imaging study (MPS) with Tc99m-sestamibi as part of cardiac clearance before a diverting end sigmoid colostomy. During the scan, incidental focal uptake was noted in the left upper anterior chest, initially felt to be within the left breast. Single-photon CT images (SPECT) of the chest were subsequently obtained during the same visit for improved localization of this focus. The focus was actually found to be in the left chest wall, likely in the anterior left rib adjacent to the myocardium. Additional foci were noted within the spine, left upper lung, and hilum (Fig. 1).

A review of medical records from another institution, in addition to correlation with outside F18-fluorodeoxyglucose (FDG) positron-emission tomography (PET/CT), MRI, and bone scans performed earlier the same year, indicated that these foci most likely represented metastases from recurrent thyroid cancer (Figs. 2-4). After further in-hospital chart review, the patient was indeed found to have a history of organ-confined follicular thyroid cancer, surgically treated with total thyroidectomy 9 years ago, followed by radioiodine ablation with 75 mCi of I-131 sodium iodide. The patient was subsequently lost to followup.

Discussion

MPS with Tc99m-sestamibi has become one of the most frequently ordered medical imaging studies. This comes as no surprise, considering the high prevalence of coronary artery disease. However, as with all imaging studies, incidental findings must be noted. This is especially true for MPS, knowing that sestamibi is a tumor-imaging agent with applications in mammoscintigraphy, parathyroid imaging, and whole-body tumor imaging in thyroid cancer patients with suspected noniodine-avid disease (1).

The validity of Tc99m-sestamibi for evaluation of recurrent and metastatic differentiated thyroid carcinoma has been well established (2-4). The diagnostic yield for Tc99m-sestamibi whole-body imaging is greatest in the evaluation of patients with suspected recurrent differentiated thyroid carcinoma when the thyroglobulin levels are elevated despite no evidence for recurrence on whole-body radioiodine scan (5). This is in order to exclude evidence of active malignancy that may have evolved into poorly differentiated or dedifferentiated disease, although (given its superior spatial resolution) FDG-PET remains the modality of choice for evaluation of noniodine-avid thyroid cancer recurrence

Citation: Hatemi L, Jabi F. Bone metastasis on Tc99-m sestamibi myocardial perfusion scan. *Radiology Case Reports*. (Online) 2014;10(1);910.

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Competing Interests: The authors have declared that no competing interests exist.

DOI: 10.2484/rcr.v10i4.910

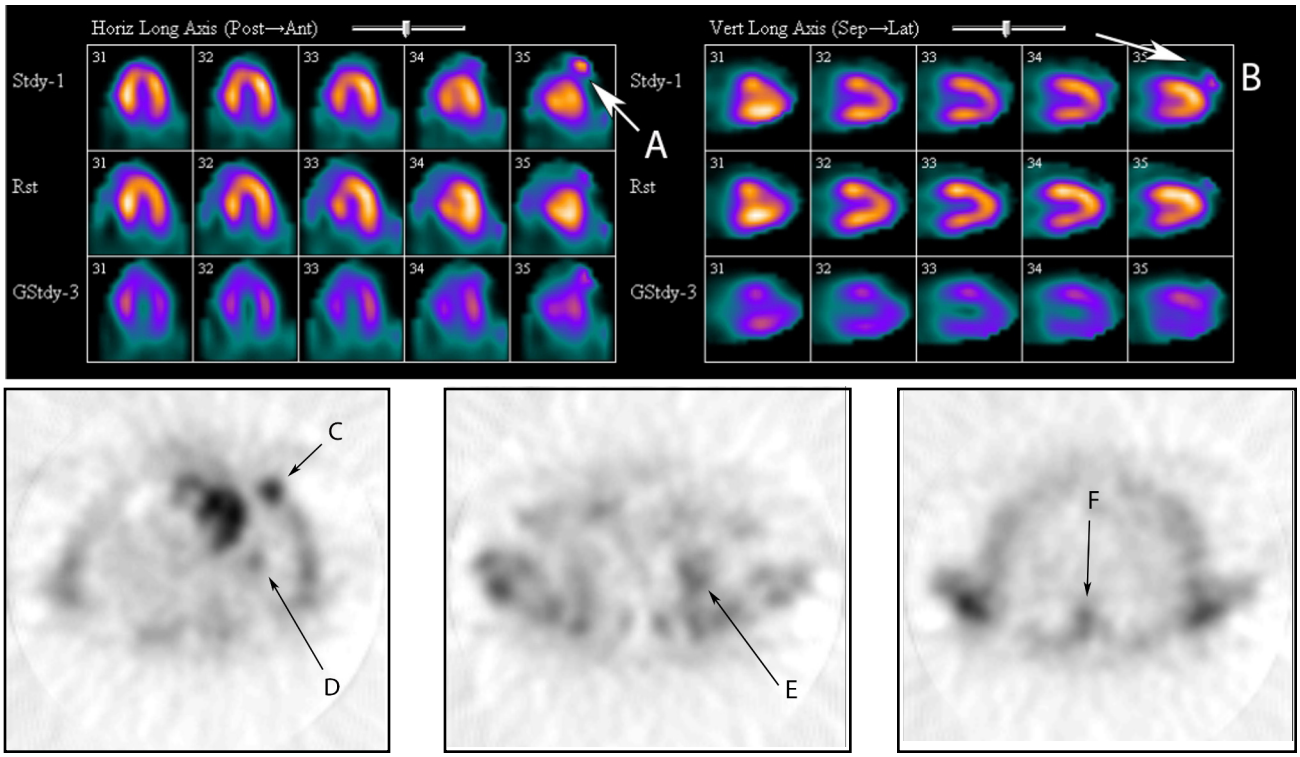

Figure 1. A 75-year-old female was referred to the nuclear medicine department for cardiac evaluation with Tc99m-Sestamibi MPS as part of cardiac clearance before a diverting end sigmoid colostomy. The patient was found to have abnormal focal uptake adjacent to the anterior wall of the left ventricle (A, B, C). Additional SPECT images in the axial, sagittal, and coronal projections were acquired during the same visit. These images localized this focus to the left fifth rib. Additional foci of sestamibi accumulation within the left upper lung field (D), left hilum (E), and right lateral aspect of the T5 vertebra (F) were demonstrated. Correlation with prior CT and FDG18-PET/CT studies confirmed these foci to be aggressive osteolytic bone metastases and lung metastasis.

Figure 2. Tc99m-MDP bone scan of the same patient four months before the MPS demonstrated a photopenic focus in the T5 vertebral body (arrow) consistent with local bone destruction. A bone scan failed to demonstrate any bone findings in the left anterior chest.

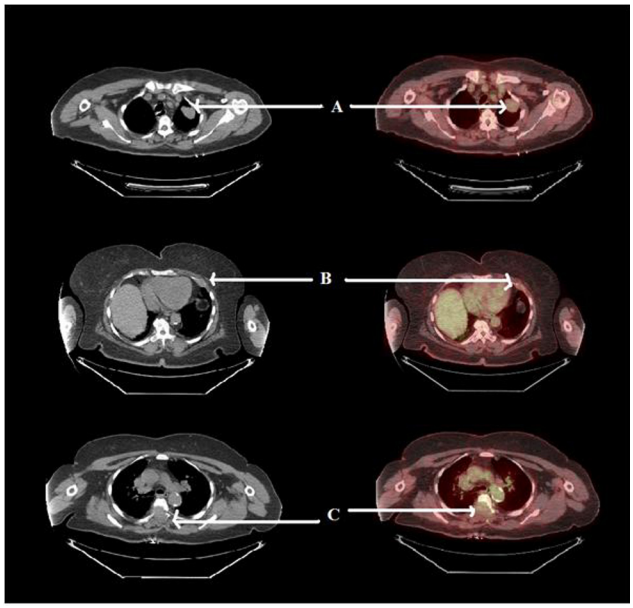

Figure 3. F18-FDG PET/CT study 4 months before the MPS demonstrating the left upper lung (A), left 5th rib (B), and right T5 vertebral lesions (C) with subtle increase in F18-FDG uptake.

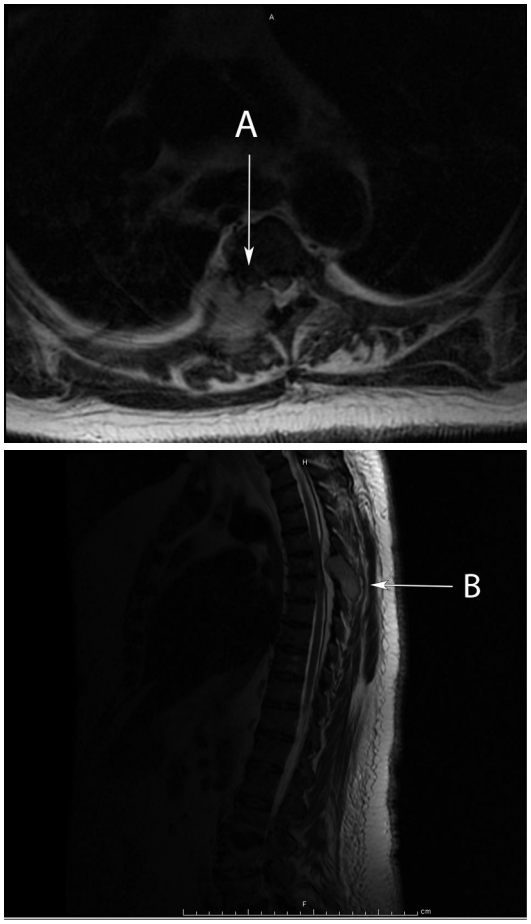

Figure 4. T2-weighted MRI demonstrates the T5 vertebral metastasis with destruction of the body and posterior elements and spinal cord impingement (A, B).

(6). Hence, it should come as no surprise that metastatic thyroid cancer, along with other abnormal foci of extracardiac sestamibi uptake (7), may be visualized on a routine MPS. Therefore, the interpreting radiologist, nuclear medicine physician, or cardiologist should always thoroughly survey the raw images on MPS for unusual focal extracardiac activity, since such a finding could potentially represent incidental malignancy, which unfortunately in this patient was attributed to bone metastasis.

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